

Recent Results from Studies with the new Swine Origin H1N1 Influenza A Virus

Project 1: Serologic cross-reactivity of serum samples from U.S pigs against the new swine origin H1N1 influenza virus

Purpose of study: An important concern is to address whether U.S commercial swine herds are susceptible to the new swine origin (S/O) H1N1 influenza virus.

Experiment:

- The new S/O H1N1 influenza A virus isolated from a person in California March 2009 (A/CA/04/2009) was obtained from the Center for Disease Control and Prevention (CDC) and grown *in vitro* (i.e., in a permissive cell line).
- The standard hemagglutination inhibition (HI) test was used to investigate whether serum samples from pigs infected or vaccinated with U.S H1N1 swine influenza virus could prevent the A/CA/04/2009 virus from agglutinating (clumping) red blood cells (this test indicates the presence of antibodies that prevent the influenza virus from attaching to red blood cells and is therefore indicative that the animal has protective antibodies).
- Thirty-eight serum samples from pigs infected between 1999-2008 with 19 H1N1 swine influenza viruses in U.S commercial swine operations were tested in the standard HI test. The 19 H1N1 swine influenza viruses selected for this study represented all four phylogenic (genetically characterized) clusters (α , β , γ , and δ) of all the endemic H1 swine influenza viruses known to circulate in the U.S.
- An additional 17 serum samples from pigs vaccinated with five different commercial products used to vaccinate pigs against H1N1 swine influenza virus in the U.S were tested by the standard HI test.

Results:

- Eleven of the thirty-eight serum samples from pigs infected with U.S H1N1 swine influenza viruses had a measurable HI titer against the A/CA/04/2009 H1N1 influenza virus.
- Only two of the commercial vaccines tested induced a measurable HI titer against the A/CA/04/2009 H1N1 influenza virus.

Conclusion: Limited cross-reactivity of serum samples from pigs infected U.S swine influenza viruses or vaccinated with commercial vaccines was demonstrated against the new S/O H1N1 influenza virus (A/CA/04/2009) as measured by the standard HI test. The results of this experiment suggest that pre-existing immunity induced by swine influenza viruses circulating in the U.S may not protect pigs against the new S/O H1N1 influenza virus presently circulating in people. Importantly, vaccines currently used to protect pigs in U.S swine operations against swine influenza virus may not be effective against the new S/O H1N1 influenza virus.

Next Steps: ARS scientists will test the efficacy of swine influenza virus vaccines in a pig vaccination challenge model to determine whether the measurable HI titers detected in vaccinated pigs correlate with protection.